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LIVERPOOL SCHOOL  
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NOTES ON  
SANITARY  
CONDITIONS  
OBTAINING  
IN PARA

BY THE  
YELLOW FEVER  
EXPEDITION

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LIVERPOOL UNIVERSITY PRESS

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LIVERPOOL SCHOOL OF TROPICAL MEDICINE

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## NOTES

ON

# SANITARY CONDITIONS OBTAINING IN PARÁ

BY THE

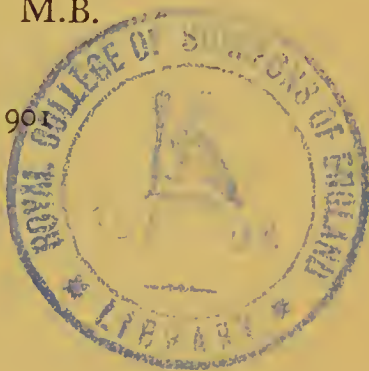
YELLOW FEVER EXPEDITION

H. E. DURHAM, M.B., F.R.C.S.

AND

WALTER MYERS, M.B.

*June, 1900, to April, 1901*



AT THE UNIVERSITY PRESS OF LIVERPOOL 1901

No. 26. October, 1901. 500

NOTES ON SANITARY  
OBTAINING IN P.

GENERAL—WATER

ALTHOUGH hitherto Pará has specific contamination of the water by the scantiness and intermittence of the supply, with consequent insuction and possible contamination through faulty or leaky pipes, it is desirable that only water which has been filtered through porcelain (e.g., Pasteur Chamberland) be drunk. Boiling alone is useless on account of the unreliability of servants. In the absence of pressure, enough hydrostatic pressure can be obtained by placing the feed tank a few feet above the filter to ensure abundant supply of water. Should the new service main be laid, filtration of the water will be desirable, since numbers of the pipes are about in the streets for months, bathed in indescribable filth; this may be well called an outbreak of water-borne disease (as typhoid fever) probable in the city.





## NOTES ON SANITARY CONDITIONS OBTAINING IN PARÁ

### GENERAL—WATER

**A**LTHOUGH hitherto Pará has been free from specific contamination of the water supply, the scantiness and intermittence of the present flow, with consequent insuction and possibilities for contamination through faulty or leaky mains, makes it desirable that only water which has been filtered through porcelain (*e.g.*, Pasteur Chamberland candles) should be drunk. Boiling alone is useless on account of the unreliability of servants. In the absence of service pressure, enough hydrostatic pressure can easily be obtained by placing the feed tank a few feet above the filter to ensure abundant supply of porcelain-filtered water. Should the new service mains be ever completed, filtration of the water will become far more desirable, since numbers of the pipes have been lying about in the streets for months, bathed in the most indescribable filth; this may be well calculated to make outbreaks of water-borne disease (as typhoid fever and dysentery) probable in the city.

## CLIMATE, RECREATION, AND LEAVE

Although in some respects Pará is not unhealthy, the climate is extremely enervating, especially with the pressure of keeping up mental activity. The extreme humidity, the comparatively high temperature, and the general monotony of the conditions combined with European working hours, are all factors which tend to react unfavourably. Associated with these conditions is the general want of recreation, or opportunity for recreation. Sundays and occasional 'national' holidays form the only days upon which any kind of outing can be obtained. The limited modes of recreation to be found at Pará are perhaps more at the command of the wealthy, than of the comparatively indigent clerk.

In a personal communication Dr. Paes de Carvalho stated that it was his custom to advise all Europeans to spend six months in temperate climates every three years. Observing persons who have been out in Pará for more lengthened periods, and have compared their energy with that of those who had recently returned from a trip in cool climates, say the difference is striking. Several Portuguese firms have a number of responsible heads for their business, whereby they are able to interchange frequently, and their success in business is ascribed to the frequent influx of freshened brains.

Probably a short holiday each year—as a few weeks in a place like Barbados—would be beneficial, and might be used as a variation on the monotony, hardly varied day by day, week by week, or month by month, of Pará. Such an annual holiday would be beneficial in enabling the constitution to withstand the moist, humid climate, and to retain more energy. Apparently no regular system of holiday obtains in Pará, in which respect the clerk or employé is worse off there than

home in England, where  
temperative. At the instance  
attempt was made to approach  
Barbados with a view of making  
conditions in regard to yellow fever  
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YELLOW FEVER

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the rise of the temperature of the

at home in England, where holidays are not so imperative. At the instance of Captain Crimp, an attempt was made to approach the quarantine board at Barbados with a view of making more reasonable regulations in regard to yellow fever, so that the place might be practically available as a health resort for Pará and the Amazon. The board was accordingly approached in the matter, but the negotiations were unsuccessful.

### YELLOW FEVER

This fever is of importance to the newcomer, and in Pará, there is considerable probability of his getting it some time in the first few months of residence. It is of great importance that patients should be put to bed and remain there from the earliest possible moment after the onset of fever. Newcomers should be earnestly warned to report any indisposition or feverishness or experience of shivering fit that they may experience at once; and they should be told that by so doing, if by mischance they have become infected with yellow fever, they will thus materially increase the probability of having merely a slight attack. Under such circumstances the temperature should be carefully taken with a clinical thermometer and, if the fever is present, the patient should at once be put to bed (a record should be kept of the degree of fever, and the pulse counted for half a minute and also noted). If a doctor cannot be obtained, a purge such as an ounce of castor oil or five grains of calomel may be given. All food (including milk and soups) should be withheld; there is probably no advantage in giving any stimulants. It may be noted that sometimes the malaise and headache may precede the rise of the temperature of the body in yellow fever;



so that should severe headache, etc., persist, the thermometer should be again consulted. A point of some importance is the question of removal of the patient to other quarters. Here the determining factor should be the place where the disease was probably caught; if the fever was probably caught in the house inhabited by the patient, he should undoubtedly be removed, otherwise he is liable to continue to receive further amounts of the germ of the fever, and to turn a mild attack into a grave one. When other susceptible persons are inhabiting the same house, it would be well that they should be watched and lodged for a time elsewhere. In carrying out such steps the individuals concerned should not be made unduly anxious; perhaps not a very easy matter. Removal as late as the fourth or fifth day is not to be recommended, as disturbance then is likely to lead to grave results.

The relation of mosquitoes to the transference of the microbes of yellow fever ought not to be ignored. By means of direct experiments upon men, the American Commission under Major Reed has shown that yellow fever can be conveyed by one sort of mosquito, scientifically named *Stegomyia fasciatus*. This is a black insect with silvery white in spots on its body and at the joints of its legs; it is very common both in Pará and Manaos in houses, and frequently gets carried upon lighters and steamers. By circumstantial evidence the Expedition thought that another house mosquito—a brown one at present unnamed—was probably concerned with the transmission of yellow fever also. The habits of these two insects are different: the black and white is a day mosquito, and only bites during daytime; the brown, on the other hand, only bites during the night. So far, then, as the former is concerned one is safe from sunset till

dawn, when biting commences; as for the latter, the hours; as for the latter, the sundown are safe. With bites can be avoided during about dawn; if a siesta is (e.g., after almoço) it should be added. It need hardly be added that a person should be attacked with suspicions that such is the cause of further bites: (1) to prevent to avoid infecting others would become dangerous for. It may be mentioned that the mosquito succeeded in keeping an infected mosquito alive for seventy-one to sixty-nine days.

Moreover, besides providing efficient mosquito net, it would be well to keep mosquitoes about the house; 'butterfly' net is perhaps the best, followed by compression. Naturally the same care should be taken in the ship, where probably the risk is as a rule there would be persons who are practically in the neighbourhood. Secondary transmission with an original case until the lapse of about other cases occurring in a short time to the presence of mosquito infected when they were brought.



dawn, when biting commences and continues nearly to sunset, the most active period being during the mid-day hours; as for the latter, the hours between sunrise and sundown are safe. With an efficient mosquito net bites can be avoided during the night and the period about dawn; if a siesta is taken during the daytime (e.g., after almoço) it should be under a mosquito net.

It need hardly be added that it is obvious that should a person be attacked with the fever, or give suspicions that such is the case, he should be protected from further bites: (1) to prevent increased inoculation, (2) to avoid infecting other mosquitoes, which then would become dangerous for other susceptible persons. It may be mentioned that the American Commission succeeded in keeping an infected black and white mosquito alive for seventy-one days, and another one for sixty-nine days.

Moreover, besides providing the patient with an efficient mosquito net, it would be advisable to destroy mosquitoes about the house; for this purpose a small 'butterfly' net is perhaps the most convenient instrument, followed by compression of the insects.

Naturally the same care should be taken on board ship, where probably the risk of further cases is greater, since as a rule there would be a number of susceptible persons who are practically permanently in the near neighbourhood. Secondary cases arising through contamination with an original case would probably not ensue until the lapse of about a fortnight or more; other cases occurring in a shorter period would be due to the presence of mosquitoes which were already infected when they were brought on board.

## MALARIA

In and about Pará the risk of getting ague or malaria is probably slight; amongst the Englishmen resident in Pará the Expedition saw only one with malaria, and he had acquired it out in the neighbouring forest. On the ships, also, the risk is probably very slight. It may be noted that the usual diagnosis of fever as 'malaria' is by no means always correct, many slight cases of yellow fever, which have been called 'malaria' by Brazilian doctors, have been seen.

## FILARIAL DISEASE

This, which is a gnat-borne disease, is not uncommonly seen in Pará; it is inadvisable to have negroes sleeping in the house.

## MOSQUITOES

Apart from the actual disease carrying capabilities of mosquitoes, steps should be taken to avoid them on general grounds; some individuals (as for instance may be found amongst passengers or crew of vessels) suffer considerably from their bites. The construction of the houses in Pará does not lend itself to the application of permanent wire netting bars in the windows, doors, etc., which is without doubt one of the best measures to adopt. Breeding places about the houses should be dealt with even though the neighbours take no trouble. At one house a prolific source of gnats was found in the cistern, tanks, and rain gutters; the former were dealt with by kerosine oil and wire nettings; the latter are difficult to clear or keep cleared because they are so fixed that they are nearly horizontal in

direction, often with long turns. Probably the proper is to give them a quite consistent they are well flushed out by out completely. The black freely in such collections of unconsidered odd vessels the treatment of these is comment. The brown m seems to breed in foul water.

In general, mosquitoes a house if they are able to find a place, so that it will never be out collections of water which places. At the same time, insects can probably only be more or less simultaneous me areas. Whether the municipa undertake anything of the sort

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Recent experiments with that mosquitoes avoid light yellow, so that in the absence



direction, often with long 'dead ends' and numerous turns. Probably the proper way to put up such gutters is to give them a quite considerable inclination, so that they are well flushed out by the rain-storms and drain out completely. The black and white variety breeds freely in such collections of rain water as are often left in unconsidered odd vessels such as barrels and tins; the treatment of these is too obvious for further comment. The brown mosquito mentioned above seems to breed in foul waters, cesspools, and the like.

In general, mosquitoes will probably remain about a house if they are able to find breeding places close at hand, so that it will never be disadvantageous to clear out collections of water which may become breeding places. At the same time, a real diminution of the insects can probably only be gained by combined and more or less simultaneous measures over considerable areas. Whether the municipal authorities in Pará will undertake anything of the sort seems doubtful.

Whilst protection from bites may be readily secured during sleep by proper nettings, this is not easy to ensure whilst one is about. When the face and hands are attacked one is often aware of the fact. This is not the case with the ankles, a region which is often bitten; the wearing of boots will afford protection, but ordinary boots are not so comfortable in a climate like that of Pará, however, the thin leather top boots which are made in Madeira seem well fitted for the purpose while indoors (it may be noted that the Commission under Mr. Satchell came well supplied with these); a similar boot made of duck or light canvas would probably be cooler, and more comfortable.

Recent experiments with coloured surfaces show that mosquitoes avoid light colours and especially yellow, so that in the absence of boots, pale coloured



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### MEMOIR II

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NOTE.—As only a few copies of this important work are left in stock, and as the plates cannot be renewed, the price of the remaining copies has been raised to two guineas.

### MEMOIR III

**Report of the Malaria Expedition to Nigeria (1900),** by H. E. ANNETT, M.D., D.P.H., J. EVERETT DUTTON, M.B., B.Ch., and J. H. ELLIOTT, M.D. Part I. *Malarial Fever, etc.* Giving a full account of the expedition, with numerous views in the text, charts, maps and two plates, and containing much matter of general importance. Quarto. Price 7s. 6d. University Press of Liverpool. ✓

### MEMOIR IV

**Report of the Malaria Expedition to Nigeria (1900),** by the same authors. Part II. *Filariasis.* Containing many new observations upon Filariæ of Birds, with numerous illustrations and nineteen plates, five of which are coloured and give the microscopical anatomy of the head of *Anopheles costalis* (by Dr. DUTTON). Quarto. Price 10s. 6d. University Press of Liverpool. ✓

#### MEMOIR V, PART 1

**First Progress Report of the Campaign against Mosquitoes in Sierra Leone (1901)**, by Major R. Ross, F.R.C.S., D.P.H., F.R.S., dated 15th October, 1901, giving details of the commencement of the Campaign, with a letter from Dr. DANIELS regarding the results arrived at to date. 8°. Price 1s. University Press of Liverpool.

NOTE.—Succeeding parts of this Memoir will contain descriptions of the further progress of the campaign in Sierra Leone and elsewhere.

#### MEMOIR VI

**Mosquito Brigades, and How to Organize Them**, by Major R. Ross, F.R.C.S., D.P.H., F.R.S., containing full details regarding the mode of starting a campaign against mosquitoes, how to conduct the work, and where to attempt it; with other matter relating to the subject. 8°. Price 3s. George Philip & Son, 32 Fleet Street, London; and

#### MEMOIR VII

**Report of the Yellow Fever Expedition to Pará (1900)**, by H. E. DURHAM, M.D., and the late WALTER MYERS, M.B. (Dr. Walter Myers died of Yellow Fever whilst serving on this expedition.) Quarto. Price 10s. 6d. University Press of Liverpool. (In the Press.)

#### MISCELLANEOUS

**Malaria and Mosquitoes.** A discourse delivered at the Royal Institution of Great Britain by Major R. Ross, D.P.H., M.R.C.S., 1900 (printed by permission of the Institution), giving a full history of the solution of the malaria problem.

**Notes on Sanitary Conditions obtaining in Pará**, by THE YELLOW FEVER EXPEDITION.

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All of the above, except Memoir VI, to be had from the Honorary Secretary to the Liverpool School of Tropical Medicine, Bto Exchange Buildings, Liverpool.



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